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ABSTRACT

This bibliography was compiled as a response to the requests for information on asbestos in schools. The citations are organized by format and include: (1) Environmental Protection Agency (EPA) reports (annotated); (2) books; (3) articles, proceedings and other reports (annotated); and (4) federal regulations and statutes (annotated). The citations are followed by a list of contact points for more information. Most of the material cited in the bibliography is available in the EPA Headquarters Library in Washington, DC. (ML)

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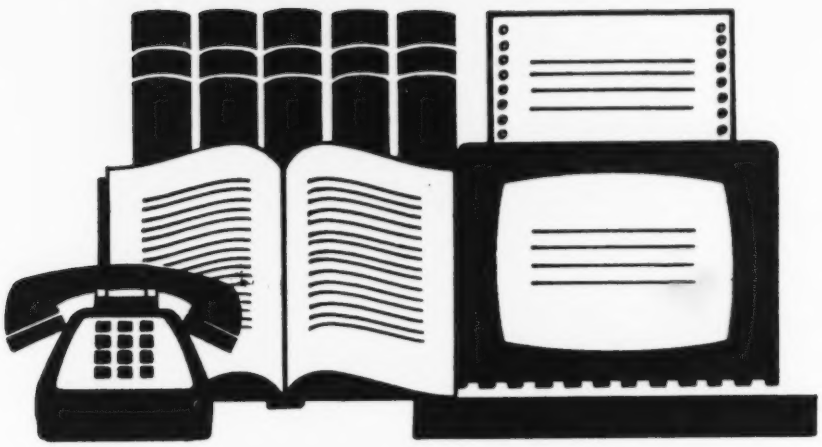

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BIBLIOGRAPHY ON

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INTRODUCTION

Asbestos is known to be a potential hazard to the health of millions of people. There is increasing concern about asbestos in school buildings. The EPA Headquarters Library receives many requests for information on asbestos in schools from EPA employees, other government agencies, organizations and independent researchers. This bibliography was compiled by Michelle S.L. Lee, Reference Librarian, to answer the requests for information on the topic of asbestos in schools.

The citations are organized by format: (1) EPA reports, (2) books, (3) journal articles, and (4) regulatory citations. Most of the material cited in the bibliography is available in the EPA Headquarters Library.

The citations are followed by a list of contact points for more information.

I. EPA REPORTS

I. EPA REPORTS

The EPA reports are listed in alphabetical order by author's last name, or if there is no author, by title. The citations are followed by the EPA report number. The report number assigned by the U.S. National Technical Information Service (NTIS) is also included. EPA reports are for sale from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virgina 22161.

The abstracts following the citations are quoted from the EPA Publications Bibliography, published by National Technical Information Service.

Asbestos-Containing Materials in School Buildings: A Guidance Document. Part 1. Springfield, VA : NTIS, 1979. 73 p. EPA 560/1-82-002. NTIS PB 82-225962.

Recently there has been an increasing awareness of the significance of environmental factors in causing illness. The fibrous minerals known as asbestos, used in many different kinds of products and applications, have entered the environment in both occupational and nonoccupational settings. The Environmental Protection Agency (EPA) is concerned with the disease-causing potential of intermittent, low-level exposures that can occur in some school buildings from certain asbestos-containing materials. EPA has established a guidance program to inform states and local school officials of the possible health hazards associated with asbestos. EPA's guidance package contains two parts. This manual, which is Part 1 of the package, is written for school officials. Part 1 outlines steps that schools can take to conduct an asbestos control program.

Brandner, Wolfgang. Asbestos Exposure Assessment in Buildings. Inspection Manual. (Final Report). Springfield, VA : NTIS, 1982. 79 p. EPA 907/9-82-009. NTIS PB 83-250266.

This manual describes procedures for inspecting buildings for friable, asbestos-containing materials and evaluating the hazard of being exposed to such materials. A method of numerically grading eight factors and using numerical scores to set abatement priorities is presented.

Brantly, E. P. Jr., and Lentzen, D. E. Asbestos-Containing Materials In School Buildings: Bulk Sample Analysis Quality Assurance Program. (Round One). Springfield, VA : NTIS, 1980. 32 p. EPA 560/13-80-23. NTIS PB 80-217243.

EPA has initiated a quality assurance (QA) program for laboratories claiming capability in the polarized light microscope (PLM) analysis of bulk samples for asbestos. Commercial and non-commercial laboratories participating in the program received samples of four fibrous materials: chrysotile, anthophyllite, fiberglass, and mineral wool. Laboratories had difficulty identifying anthophyllite and two false positives were reported for the mineral wool sample. All laboratories properly identified chrysotile. A performance rating based on proper identification of positive (asbestos) and negative (non-asbestos) samples was scored for and reported to the commercial laboratories. Reference reports were sent to all participating laboratories. Continuation of the program with future sample sets is anticipated.

Brantly, E. P. Jr. Asbestos-Containing Materials in School Buildings: Bulk Sample Analysis Quality Assurance Program. (Final Report). Springfield, VA : NTIS, 1981. 34 p. EPA 560/5-81-001. NTIS PB 81-225849.

The second round of the Environmental Protection Agency (EPA) voluntary quality assurance (QA) program for commercial laboratories claiming capability in the polarized light microscope analysis of bulk samples for asbestos was conducted in August and September, 1980. Seventy-six laboratories each received bulk samples of two asbestiform minerals and two nonasbestos materials: amosite, crocidolite, cellulose, and wollastonite. A performance rating based on correct classification of positive (asbestos) and negative (nonasbestos) samples was scored for and reported to participating laboratories. Among the inaccurate resuits reported were 3 false negatives (crocidolite) and 32 false positives (3 cellulose, 29 wollastonite). QA program results are made available to the laboratories, the EPA, and the public. Continuation of the QA program with future samples sets is anticipated.

Brantly, E. P. Jr. et al. Bulk Sample Analysis for Asbestos Content: Evaluation of the Tentative Method. Springfield, VA : NTIS, 1982. 136 p. EPA 600/4-82-021. NTIS PB 82-196841.

The U.S. Environmental Protection Agency Asbestos-in-Schools Program was established in March, 1979 to provide information

and technical assistance to the public for addressing problems presented by asbestos-containing insulation materials in school buildings. Because there were no existing standard procedures for the qualitative and quantitative analysis of asbestos in bulk materials, the Office of Pesticides and Toxic Substances, Washington, DC, and the Environmental Monitoring Systems Laboratory, Research Triangle Park, NC, jointly sponsored an effort to produce a practical and objective analytical protocol. Draft procedures were written for the analysis of bulk samples by polarized light microscopy (PLM) and X-Ray powder diffraction (XRD). Following review, the Tentative Method for the Determination of Asbestiform Minerals in Bulk insulation Samples (March, 1980) was submitted to a performance testing program that involved multiple laboratory analysis of prepared samples with known asbestos content. This report presents the results of the testing study and provides observations and preliminary characterization of the utility and operational parameters of the Tentative Method.

Cesario, J. F., et al. Identifying Potential Asbestos Exposures in Schools: The New York City Experience. Springfield, VA : NTIS, 1981. 55 p. EPA 560/5-81-010. NTIS PB 83-256214.

This report describes the experience of the New York City (NYC) Board of Education and their asbestos-in-schools program. The program objectives were to: (a) identify current and potential asbestos exposures in NYC public schools, (b) evaluate the seriousness of these asbestos exposures, (c) recommend appropriate abatement action, and (d) oversee the completion of the recommended action. A survey of all school buildings was completed and priority problem areas were identified. Major abatement activities were scheduled for summer recess periods and completed as funds became available.

Constant, Paul C. Jr., et al. Airborne Asbestos Levels in Schools. Springfield, VA : NTIS, 1983. 186 p. EPA 560/5-83-003. NTIS PB 84-129683.

Air (116) and bulk (192) samples were collected from 48 units at 25 different schools of an urban independent school district. These were analyzed respectively by transmission electron microscopy and polarized light microscopy techniques for asbestos fiber concentrations. The new factor of releasability (of fibers) rating resulted from the bulk fiber analysis. Each sampling site was rated by a special five-person team for assessment tools: algorithm, condition, accessibility, part of air moving system, material exposure, friability and water damage, and people's activity at the site. The results were

statistically analyzed to document potential exposure to airborne asbestos resulting from the friable, asbestos-containing material in schools and to develop an exposure assessment tool that would be based on the above stated factors.

Greerblatt, Janet. Evaluation of the Asbestos-in-Schools Identification and Notification Rule. Springfield, VA : NTIS, 1984. 245 p. EPA 560/5-84-005. NTIS PB 85-135085.

The Asbestos-in-Schools Identification and Notification Rule effective June 28, 1982, required all public and private local education agencies (LEAs) to (1) inspect for friable materials; (2) sample and analyze these materials when found; (3) post notice of inspection results and notify employees and parents in schools with asbestos-containing friable materials (ACFM); and (4) maintain records of the findings at the LEAs and schools. A stratified systematic sample of 1,800 public and 800 private LEAs was randomly selected proportionate to the square root of enrollment. A telephone survey found that 83 percent of the LEAs have begun or completed inspections and 94 percent of all schools have been inspected. Of the schools inspected, 35 percent found ACFM. Almost all LEAs with ACFM have abatement programs (93%), about one-third of which (31%) are operations/maintenance only. Only 9 percent of the LEAs were in compliance with the rule by June 28, 1983, the rule's compliance date; and 11 percent were by January 1984, the date of the survey. Record-keeping and notification were the major problem areas of noncompliance. QA site visits were made to 38 LEAs and 94 schools within these LEAs were inspected. The LEA data collected during the site visits agreed substantially with the telephone survey data.

Indoor Air Pollution: An Emerging Health Problem. Springfield, VA : NTIS, 1980. 46 p. CED-80-111. NTIS PB 81-160087.

Traditionally it has been presumed that a person was protected from polluted air when indoors. Recent research has shown, however, that this may not always be true. Various harmful pollutants including radon, formaldehyde, and nitrogen dioxide have been found in the air in homes, offices, schools, and even in recreational facilities. The problem may even be made worse by Government energy conservation programs which encourage the 'buttoning-up' of buildings. Federal efforts to deal with the problem have been piecemeal, receiving little support primarily because no one Federal agency has responsibility for the problem. Until responsibility is assigned to one agency to oversee Federal efforts, they will continue to be ineffectual. In this report GAO recommends actions that the Environmental Protection Agency and the Congress can take to help resolve the situation.

Indoor Pollutants. Springfield, VA : NTIS, 1985. 555 p. EPA 600/6-82-001. NTIS PB 82-180563.

This report is intended to characterize the quality of the indoor environment-primarily with respect to airborne pollutants, although others are discussed-and to determine the potential adverse health effects of indoor pollutants. The charge was to review, compile, and appraise the available knowledge. The committee has also identified the research needed for abatement of indoor pollution. 'Indoor' refers to the environments in homes, schools, public buildings, and similar spaces to which the public has access; industrial working environments, however, are excluded from consideration here.

Keys, Dale L. and Bertram P. Price. Guidance for Controlling Friable Asbestos-Containing Materials in Buildings. Springfield, VA : NTIS, 1983. 79 p. EPA 560/5-83-002. NTIS PB 83-214924.

This document provides information that supplements previous EPA guidance on controlling asbestos-containing materials found in buildings. The document (1) provides a current summary of data on exposure to airborne asbestos, (2) identifies organizational and procedural issues in establishing an asbestos program, (3) reviews technical issues confronted when assessing the potential for exposure to airborne asbestos in particular indoor settings, (4) summarizes and updates information on applicability, effectiveness, and relative costs of alternative remedial actions, (5) suggests a structured process for selecting a particular course of action given information on exposure levels, assessment methods, and abatement techniques, (6) introduces and discusses criteria for determining successful asbestos control. The material presented is a summary of information and experience gained over the 4 years since previous guidance was published.

Lentzen, D. E., et al. Interim Method for the Determination of Asbestos in Bulk Insulation Samples. Springfield, VA : NTIS, 1982. 54 p. EPA 600/4-82-020. NTIS PB 83-153643.

The U.S. Environmental Protection Agency Asbestos-in-Schools Program was established in March, 1979 to provide information and technical assistance to the public for addressing problems presented by asbestos-containing insulation materials in school buildings. Because there were no ex'sting standard procedures for the qualitative and quantitative analysis of asbestos in bulk materials, the Office of Pesticides and Toxic Substances, Washington, D.C., and the Environmental Monitoring Systems

Laboratory, Research Triangle Park, NC, jointly sponsored an effort to produce a standard analytical protocol. This report presents information on the development and characterization of the standard procedures for analysis of bulk samples with polarized light microscopy (PLM) and X-Ray diffraction (XRD), and includes the Interim Method for the Determination of Asbestos in Bulk Insulation Samples.

Logue, Everett and Tyler Hartwell. Characteristics of An Asbestos Exposure Assessment Algorithm. Springfield, VA : NTIS, 1981. 85 p. EPA 560/5-81-005. NTIS PB 83-253500.

This report describes the characteristics of a proposed asbestos exposure assessment algorithm. Algorithm variable distributions are presented along with corrections between various algorithm variables in defferent locations (e.g., New York City, North Carolina and Montgomery County, Ohio). Available data are analyzed and discussed from the perspective of the algorithm's measurement reliability and validity.

Lucas, D., et al. Asbestos-Containing Materials in School Buildings: Guidance for Asbestos Analytical Programs. Springfield, VA : NTIS, 1980. 106 p. EPA 560/13-80-017A. NTIS PB 81-243586.

This document is one in a series prepared in support of the EPA Asbestos-In-Schools Program. It was developed to provide guidance to local school officials and their staffs in determining the presence or absence of asbestos in school buildings. Data and information generated during the EPA Technical Assistance Program have been used to design a rigorous sampling and analysis scheme for bulk materials. Implementation of the enclosed sampling protocol will reliably document the presence or absence of asbestos in the bulk materials and provide an interval estimate of the asbestos content.

Lucas, D., A. V. Rao, and T. Hartwell. Asbestos-Containing Materials in School Buildings: Guidance for Asbestos Analytical Programs. Statistical Background Document. Springfield, VA : NTIS, 1980. 51 p. EPA 560/13-80-017B. NTIS PB 82-225343.

This report presents detailed sampling procedures and laboratory quality assurance measures for bulk samples collected in school buildings. Statistical support for these procedures is given.

Nicholson, William J., et al. Asbestos Contamination of the Air in Public Buildings. Final Report. Springfield, VA : NTIS, 1975. 70 p. EPA 450/3-76-004. NTIS PB 250980.

From 1958 through 1973 asbestos-containing material was used extensively for fire-proofing high-rise office buildings. Earlier use of this material for decorative and acoustical purposes dates from the mid-1930's. Concern exists that these past uses of asbestos may lead to current contamination of building air. This may occur either through damage or erosion of acoustical spray materials or through erosion into building air supply systems of asbestos fibers from spray-lined plenum spaces in office buildings. In order to access such possibilities, 116 samples of indoor and outdoor air have been analyzed for asbestos. Nineteen buildings in five United States cities were chosen to represent the various construction uses of asbestos-containing spray materials. The results of this sampling and analysis demonstrate that significant contamination can occur in the air supply systems of buildings in which fibrous type-dry spray asbestos-containing fireproofing materials were used. Moreover, erosion of similar materials applied for decorative or acoustical purposes was also found to occur. In contrast, no contamination was demonstrable in buildings in which cementitious spray material had been used.

Nicholson, William J. Draft Asbestos Health Assessment Update. Springfield, VA : NTIS, 1984. 146 p. EPA 600/8-84-003A. NTIS PB 84-186832.

Data developed since the early 1970's from large population studies with long follow-up strengthen the association of asbestos exposure to disease. Lung cancer and mesothelioma are the most important asbestos-related causes of death among exposed individuals. The accumulated data suggest that the excess risk of lung cancer from asbestos exposure is proportional to the cumulative exposure (the duration times the intensity) and the underlying risk of lung cancer in the absence of exposure. The risk of death from mesothelioma appears to be proportional to the cumulative exposure to asbestos in a given period. Animal studies confirm the human epidemiological results. All major asbestos varieties produce lung cancer and mesothelioma with only limited differences in carcinogenic potency. Some measurements demonstrate that significant asbestos exposure, exceeding 100 times the background, occurs to individuals in non-occupational environments. Currently, the most important of these non-occupational exposures is from the release of fibers from asbestos-containing surfacing materials in schools, auditoriums, and other public buildings or from asbestos fireproofing sprayed in high-rise office buildings.

Patton, Janice L., et al. Asbestos in Schools. Springfield, VA : NTIS, 1981. 264 p. EPA 560/5-81-002. NTIS PB 81-225823.

Four approaches to assessing the potential for asbestos exposure in schools were evaluated: (1) a proposed exposure-ranking system or algorithm, (2) bulk sampling and analysis of the asbestos-containing materials, (3) a measurement of stimulated fiber release, and (4) air sampling. The scoring consistency was evaluated for the factors in the algorithm; friability and activity was scored with the least consistency, and exposure and the presence of air-moving systems with the most consistency. Scoring consistency improved with rater training. The variability in the determination of asbestos content was found to be associated with the laboratory analysis more so than with the sampling process. False negatives were found to occur, even at asbestos levels greater than 10 percent. The potential for release of fibers by physical disturbance of the asbestos - containing material was demonstrated with the use of a vibrator in contact with ceilings in schools; the releasability was found to increase with asbestos content and friability. Only a limited effort was devoted to air sampling, it was done for short periods (1 hour), and the analyses were done by phase microscopy (which detects only the fibers longer than 5 microns with an aspect ratio greater than 3:1). The airborne fiber levels were less than 0.70 fibers/cc in all cases but one.

Price, Bert., et al. Airborne Asbestos Levels in Schools: Design Study. Springfield, VA : NTIS, 1981. 92 p. EPA 560/5-81-006. NTIS PB 83-253492.

This document describes a proposed field study to collect data in schools that are to be used to analyze and validate two asbestos exposure assessment algorithms as compared to levels of airborne asbestos. This field study would involve algorithm scoring (including bulk asbestos sampling) and air sampling in sites (e.g., classrooms) within selected schools.

Roa A. V., et al. Asbestos Analytical Programs Bulk Sample Analysis: New York City and Maryland. Springfield, VA : NTIS, 1980. 41 p. EPA 560/13-80-21. NTIS PB 81-146722.

This document describes the statistical analyses of bulk sample data taken from school buildings in two locations: New York City and Maryland. The bulk samples were analyzed for asbestos by various laboratories and the results given to the Research Triangle Institute for analysis. In particular, Section I of this report describes the analysis of the New York City data which reported the presence or absence of asbestos (Amosite or Chrysotile) in 474 bulk samples taken from various typer of building material in New York City schools. Section II describes the analysis of the Maryland data which contains analysis

of 37 split-asbestos bulk samples taken from Maryland public schools. The split-samples in Maryland were sent to two or more laboratories which determined presence or absence of asbestos (Amphibole and Chrysotile) as well as actual levels of asbestos.

Sawyer, Robert N. and Charles M. Spooner. Sprayed Asbestos-Containing Materials in Buildings: A Guidance Document. Part 2. Springfield, VA : NTIS, 1978. 119 p. EPA 450/2-78-014. NTIS PB 82-225970.

This guidance document summarizes the available information on sprayed asbestos-containing materials in buildings. It describes actions that may be taken when a building owner knows or suspects that friable asbestos materials are present. Application of sealant coats and removal of asbestos materials are discussed.

Sebastien, P., et al. Measurement of Asbestos Air Pollution Inside Buildings Sprayed with Asbestos. Springfield, VA : NTIS, 1980. 75 p. EPA 560/13-80-026. NTIS PB 81-147001.

This report is a translation of a document prepared in 1977 for the French Ministry of Health and the French Ministry for. the Quality of Life-Environment on the measurement and assessment of airborne asbestos levels in buildings throughout Paris. The methods of air sampling and transmission electron microscopic analysis, as well as a discussion of the results, are presented. Also included are extensive tables and figures summarizing the data collected. The study was completed in 1977, by the Laboratoire d'Etude des Particules Inhalees (Prefecture de Paris) and the Institut de Recherches Universitaires Sur l'Environment (Universite'Paris-Val de Marne). Mr. Patrick Sebestien (Prefecture de Paris) provided this revised update of the study in July 1980.

Strenio, J., et al. Asbestos in Buildings: A National Survey of Asbestos-Containing Friable Materials. Springfield, VA : NTIS, 1984. 236 p. EPA 560/5-84-006. NTIS PB 85-136653

A national representative sample of 231 buildings at 10 sites was inspected for potentially asbestos-containing materials. Bulk samples (1,510) were taken and analyzed by polarized light microscopy. Estimates were made of the number and percent of buildings with asbestos-containing friable materials. In 1973, EPA banned the use of asbestos thermal and acoustical insulation materials except for decorative purposes, and in 1978 EPA banned them for all purposes.

Wright, Susan, Stephen Schoepke, and Philip Mathias. Economic Impact Analysis of Proposed Identification and Notification Rule on Friable Asbestos Containing Materials in Schools. Proposed Rule, Section 6 Toxic Substances Control Act. Springfield, VA : NTIS, 1980. 294 p. EPA 560/12-80-004. NTIS PB 81-141640.

This study examines the economic impact of the detection and notification of schools which have areas contaminated with friable asbestos-containing materials. The problem is identified by geographic area and by square footage of asbestos-containing materials per school. Unit costs are examined by region for inspection and analysis of samples by X-Ray diffraction, electron microscopy, and optical microscopy. The total impacts of Asbestos Schools Rule No. 1 are also presented and discussed.

Wright, Terry L. and Everett E. Logue. Identifying Potential Asbestos Exposures in Schools: The Montgomery County Experience. Springfield, VA : NTIS, 1980. 61 p. EPA 560/13-80-039. NTIS PB 81-243503.

This report summarizes the experience of the Montgomery County Combined General Health District in their asbestos-in-schools control program. A survey of all schools within the District's jurisdiction was completed. Bulk samples of friable materials were collected and analyzed for their asbestos content, and asbestos exposure scores were obtained for those areas where asbestos was present. Recommendations for appropriate abatement procedures were made based upon exposure scores, and the values of score components.

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II. BOOKS

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III. ARTICLES, PROCEEDINGS AND OTHER REPORTS

"Asbestos." Clean Air. Vol. 13, No. 2, 1983, p. 57. (EN)

Asbestos was once considered a health risk only for asbestos workers. Now it is a known potential hazard to the health of many segments of the general population. Exposure to asbestos dust and fibers can result in asbestosis, cancer, and mesothelioma. OSHA has established limits for worker exposure to this substance. EPA has prohibited virtually all uses of sprayed asbestos materials, and is continuing research on its health effects.

The Asbestos Dilemma: Detection, Regulatory Options, and Statistical Approaches to Identification." Hypotenuse. July-August 1983. pp. 10-19. (EN)

The EPA regulations that took effect in June 1983 require that school buildings be inspected for the presence of friable asbestos. Since the late 1970s, asbestos-containing materials have been removed from thousands of schools. Although the substance is known to be toxic, no one knows for sure what risks are associated with low levels of exposure. The cost effectiveness of several alternatives for regulating asbestos is discussed. A discussion of statistical approaches to identification and asbestos hot-lines are included.

Asbestos School Hazard Detection and Control Act of 1979." Sen. Comm. Labor Human Relations Hearings. 96 Con. 2, March 17, 1980. (EN)

Hearings were held to receive testimony on the proposed Asbestos School Hazard Detection and Control Act of 1979. S. 1658 would establish a program for the inspection of schools to detect the presence of asbestos, and provide loans to states or local educational agencies to replace it with other building materials. The extent of asbestos contamination in U.S. schools and other buildings was estimated, and the potential human health effects of excessive asbestos exposure were reported. Testimony was received from Sen. Jacob Javits (D-NY), Sen. Clairborne Pell (D-RI), and Representatives from the National Institute of Environmental Health, New York City Board of Education, and Mount Sinai School of Medicine. Memoranda and related documents are transcribed.

Baldwin, C. C. et al. "Asbestos in Colorado Schools." Public Health Report. Vol. 97, No. 4, July-August 1982, pp. 325-331. (ME)

III. ARTICLES, PROCEEDINGS AND OTHER REPORTS

The citations are listed in alphabetical order by author's last name, or if there is no author, by title.

The abstracts for the following material are either quoted directly from the article, or are from a database that indexes it. Abstracts quoted from a database are followed by a two-letter abbreviation that identifies the source. These databases and their abbreviations are listed below.

(EB) Environmental Bibliography
Environmental Studies Institute
2740 Alameda Padre Serra
Santa Barbara, CA 93103

(EN) Enviroline
Environmental Information Center, Inc.
292 Madison Avenue
New York, NY 10017

(ER) ERIC Processing and Reference Facility
4833 Rugby Avenue, Suite 303
Bethesda, MD 20014

(ME) Medline
Medlars Management Section
National Library of Medicine
8600 Rockville Pike
Bethesda, MD 20209

(NT) National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161

(PA) Pollution Abstracts
Cambridge Scientific Abstracts
5161 River Road
Bethesda, MD 20816

(PS) Public Affairs Information Service, Inc.
11 West 40th Street
New York, NY 10018

(OS) Occupational Safety and Health (NIOSH)
Technical Information Branch
National Institute for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226

Forty-one public schools in Colorado were drawn at random and surveyed for asbestos-containing materials. After bulk samples of possible asbestos materials from the schools were collected and analyzed, the K2 asbestos screening test was used to eliminate samples that did not contain asbestos. Samples with positive results on the K2 test were analyzed by an outside laboratory by polarized light microscopy. The risk of potential exposure presented by these materials was then assessed for each site from which a sample was taken. Of 113 samples collected, results were negative for asbestos for only 10.6 percent by the K2 test. Of the 101 samples for which results were positive, 56 actually contained 1 or more forms of asbestos. Twelve of these 56 samples were from sprayed material; the remaining 44 were from other materials containing asbestos. Of the 41 schools sampled, 31 had asbestos materials in one of more locations. The potential exposure values for these materials ranged from very low to very high, but the majority had high-exposure potentials. Estimates based on the survey of the 41 schools indicated that 63 to 89 percent of the public schools in Colorado have asbestos materials that present potentially serious hazards, not only to the children, teachers, and staff, but also to members of the community who use the school buildings after regular school hours.

Becker, Susan. "Asbestos in the Classroom." Instructor. Vol. 94, No. 3, October 1984. pp. 122-123. (ER)

Thousands of schools contain dangerous asbestos which threatens the safety of students and teachers. The Environmental Protection Agency can be contacted to inspect and advices on this problem. Suggestions are offered for school personnel who suspect their school may contain asbestos.

Bozzelli, Joseph W., Russell, Joel J. "Airborne Asbestos Levels in Several School Buildings Before and After Bulk Asbestos Removal." International Journal of Environmental Studies. Vol. 20, No. 1, November, 1982. pp. 27-30. (EN)

Airborne particulate samples were collected in several public schools before and after friable asbestos-containing insulation material had been removed from ceilings. Transmission electron microscopy with selected area electron diffraction techniques facilitated fiber identification and counting. Asbestos fiber concentrations in indoor air were in the range 5-40 mg/M3 before insulation removal. Measurements made one week after removal showed reductions of 56-90%.

Brown, Arnold L., et al. "The Reliability of Measures of Amphibole Fiber Concentration in Water." Environmental Research. Vol. 12, No. 210, October 1976, pp. 150-161. (EN)

Water samples from communities adjoining and from Lake Superior, Minn., itself are examined in eight laboratories by electron microscopy to determine the concentration of amphibole fibers. Exact measurements between and among laboratories differed, although the relative variability among laboratories was reasonably uniform. To compare precisely concentrations of amphiboles at two sites or under two different sets of circumstances, two provisions must be fulfilled: All measurements must be made in the same laboratory using the same equipment and the same technician; and several aliquots of each water sample must be examined independently.

Browne, R. C. "The Newcastle Papers in Industrial Medicine Over the Last 21 Years." British Journal of Industrial Medicine. Vol. 25, 1968, pp. 187-195. (ME)

A review of the papers published by the Chair of Industrial Health in Newcastle upon Tyne shows that research on industrial lung disease has gradually shifted from coal to beryllium, asbestos, and antimony. Coal miners with nystagmus were shown to be similar to miners without the disease but psychologically less stable. Decompression sickness has also become an important interest, and studies were conducted on lead poisoning in shipbreakers and smelters, vanadium poisoning in fitters and gasmakers, teeth decalcification in a fruit salt factory, noise levels in a glassblowing school and in several power stations, and the thermal decomposition of protective coatings and welding rods.

Carter, Luther J. "Asbestos: Trouble in the Air from Maryland Rock Quarry." Science. July 15, 1977. Vol. 197, No. 4300, pp. 237-241. (EN)

During recent months, a growing number of affluent residents in Montgomery County, Md., have been in an uproar over what they perceive as a serious possibility of a long-term cancer threat. Crushed stone containing possibly dangerous concentrations of asbestos fibers has been produced for some years at a large quarry near Rockville. The asbestos-bearing stone has been used, often in a dusty, unbound form, in surfacing roads, school playgrounds, and park areas, not to mention private driveways and parking lots. The controversy over use of the materials and potential health dangers is explained.

Castleman, B. I., Vera Vera, M. J. "Impending Proliferation of Asbestos." International Journal of Health Service. Vol. 10, No. 3, 1980, pp. 389-403. (ME)

The international asbestos industry is under considerable pressure in some countries to control dust exposures in the workplace and restrict pollution. In addition, major firms in the United States face mounting compensation costs for past failures to protect asbestos workers. At the same time, however, the asbestos industry is expanding in developing nations, largely on the strength of sales of asbestos-cement construction materials. This report describes problems encountered with the use of asbestos-cement in schools and low-income housing in Puerto Rico, resulting in the condemnation of these buildings and the relocation of over 1,000 families at public expense. The manufacturer of the asbestos-cement panels, a Colombian affiliate of the European-based multinational Eternit, escaped all liability. The issue is presented as a needless, expanding threat to public health worldwide. Safe, economic alternatives exist, such as the use in some cases of crop waste fibers in place of asbestos as a cement binder. There have also been major advances in the commercialization of asbestos-free brake and clutch friction products.

Chadwick, D. C., et al. "Airborne Asbestos in Colorado Public Schools." Environmental Research. Vol. 36, No. 1, February 1985, p. 1-31. (ME)

Levels of airborne asbestos for six Colorado public school facilities with sprayed-on asbestos materials were documented using three analytical techniques. Phase contrast microscopy showed levels up to the thousandths of a fiber per cubic centimeter (f/cc), scanning electron microscopy (SEM) up to the hundredths of a f/cc, and transmission electron microscopy coupled to selected area electron diffraction and energy dispersive X-ray analysis (TEM-SAED-EDXA) up to the tenths of an asbestos f/cc. Phase contrast microscopy was found to be an inadequate analytical technique for documenting the levels of airborne asbestos fibers in the schools: only large fibers which were not embedded in the filter were counted, and asbestos fibers were not distinguished from nonasbestos.

Charette, Mike J. "Arizona's School Asbestos Program." Journal of Environmental Health. Vol. 45, No. 3, November-December 1982, pp. 135-137. (EB)

The state of Arizona Dept. of Education operates a successful program to remove asbestos-containing building materials from schools. (Drawing from the expertise of the Dept. of Health Services, Bureau of Environmental Hygiene and Sanitation, Bureau of Waste Control, and eliciting cooperation of school officials). Includes an asbestos detection/control flow chart.

"Controlling Asbestos in Schools." EPA Journal. Vol. 5, No. 7, July-August 1979. pp. 20-21. (PA)

Although the degree of risk to pupils in schools is not quantified, federal and state governments are establishing programs to help educators check for asbestos-containing materials in the schools and to correct hazardous conditions. Funds are currently being appropriated for school inspections and repairs. Medical research has attributed lung cancer, asbestosis, mesothelioma, and gastrointestinal cancer to regular exposures to asbestos. Asbestos-containing materials have been sprayed on walls, ceilings, structural components, and pipes in many schools. An estimated 10,000 of the nation's 90,000 schools contain asbestos materials. An EPA-sponsored program established to help correct the problem includes a survey form to be filled out by school officials that will help determine the extent of exposure and the ability of state and local officials to correct problems encountered.

Dekany, John D. "School Asbestos Control Program." EPA. Presented at National Environmental Health Association 43rd Annual Educational Confrence. Charleston, June 23-28, 1979. p. 8A(9). (EN)

Drayton, William. "America's Toxic Protection Gap: The Collapse of Compliance with the Nation's Toxic Laws (American's Toxic Protection Gap: An Overview). Environmental Safety Report, P1 (16), July 1984. (EN)

The collapse of compliance with the nation's toxic protection laws enacted largely in the 1970's is reviewed. Millions of Americans live with one of the roughly 8,000 active and 22,000-35,000 abandoned hazardous waste sites, and there are 70,000 underground storage tanks at local gas stations and other facilities leaking and probably polluting groundwater that half of all Americans use for cooking and drinking. The Reagan Administration's goal of cutting back on regulation is partly responsible for the 80% noncompliance found in laws on water, hazardous waste, asbestos in schools, and probably air.

In an attempt to control for the urban effect, geographic gradient and socioeconomic class, each county in the United States with asbestos deposits was matched for percent of area that was urban and for median years in school with two nearby counties that did not have known asbestos deposits. The study of cancer mortality rates in these matched counties provides no evidence that naturally-occuring asbestos, primarily chrysotile and amphibole, is a great hazard to the general population of counties with asbestos deposits.

Fodero, Severio D. "Removal and Disposal of An Environmental Carcinogen: Asbestos." Journal of Environmental Health. Vol. 40, No. 3, November-December 1977. pp. 133-137. (ER)

This article details the removal and disposal of asbestos ceiling material in a Yale University building. The removal process utilized a water and wetting agent technique used by firefighters and the debris disposal was in a sanitary landfill, following federal regulations for the handling of hazardous materials.

Henderson, William J., et al. "Analysis of Particles in Stomach Tumors from Japanese Males." Environmental Research. Vol. 9, No. 3, June 1975. pp. 240-250. (EN)

The particulate material present in stomach tumors removed from Japanese males is analyzed. An extraction-replication technique used in association with electron microscope-microanalysis provides evidence for the presence in tumor tissue of kaolin, talc, aluminum and calcium silicates, and some types of asbestos fibers.

Ingram, John D. "Insurance Coverage Problems in Latent Disease and Injury Cases." Environmental Law. Vol. 12, No. 2, Winter 1982, pp. 317-362. (EN)

The anticipated flood of litigation from latent disease claims-stemming from initial exposure to a toxic substance-will impact the financial health of insurance companies and certain industries. The basis for imposing liability on asbestos manufacturers and distributors for asbestos-related disease is examined. There is general agreement that disease occurrence may be a gradual process, though the unspecified time of the disease-triggering mechanism obfuscates the obligations of health insurers. Rules of construction for insurance policies are delineated.

Elias, J. D. "Dry Removal of Asbestos." American Industrial Hygiene Association Journal. Vol. 42, No. 8, 1981. pp. 624-625. (PA)

A method for the dry removal of friable asbestos has been developed. The Workplace Safety and Health Branch in Manitoba's Labour and Manpower Department and Power Vac Manitoba Limited have cooperated in the production of an improved procedure. It was employed for the first time in the fall of 1979 when the Industrial Hygiene Section was asked for advice about removal of asbestos from a Winnipeg school division warehouse. Fans were used to maintain the work area under negative pressure to prevent the spread of asbestos throughout the building. The exhaust air was filtered to prevent environmental contamination, and special precautions were taken to protect workers.

Enterline, Philip E. "Extrapolation from Occupational Studies: A Substitute for Environmental Epidemiology." Environmental Health Perspectives. Vol. 42, December 1981. pp. 39-45. (ME)

Three linear models - based on data from the U.S., Canada, and the U.K. - for extrapolating occupational data to general environmental exposures are described. The models are applied to asbestos exposures resulting from heat shields in hair dryers and asbestos exposures in public school buildings; cancer mortality from these exposures are predicted. Linear models are compared to a curvilinear dose-response curve which shows little response at low levels of exposure. Asbestos exposure in school buildings poses more of a risk than hair dryers.

Faich, G. A. "Asbestos Hazard Evaluation in Rhode Island Schools." American Journal of Public Health. Vol. 70, No. 2, February 1980, pp. 162-164. (EN)

Asbestos (1332214) hazards were studied in 326 Rhode Island public and private schools built between 1950 and 1973. The presence of spray-on asbestos was confirmed in 24 schools; of these, the material in 15 schools showed no visible deterioration but was classified as a potential hazard. Five schools had areas of minor deterioration, and four schools had major overt asbestos hazards. Hazard abatement for these schools involved removing the material, applying sealants, or both.

Fears, T. R. "Cancer Mortality and Asbestos Deposits." American Journal of Epidemiology. Vol. 104, No. 5, November 1976, pp. 523-526. (ME)

"International Toxicity Update." Dangerous Properties of Industrial Materials Report. Vol. 3, No. 6, November-December 1983, pp. 13-21. (EN)

Research conducted and standards issued in various nations concerning human exposures to toxic substances are examined. Safeguards necessary to prevent the accumulation of dangerous carbon monoxide concentrations in car parks were outlined in the U.K. EPA has issued regulations for reducing risks to human health from exposure to asbestos-containing materials in school buildings. A comprehensive body of information on detection, fate, and biological effects of chromium in the environment has been published by API. Other international activities surveyed focus on chloroform, the pesticide dibromochloropropane, PCB, paraquat dichloride, aerosols, and ethylene glycol monoalkyl ethers.

Irving, K. F., et al. "Asbestos Exposure in Massachusett's Public Schools." American Industrial Hygiene Association Journal. Vol. 41, No. 4, April 1980. pp. 270-276. (OS)

Asbestos exposures in 1,425 Massachusetts public schools were evaluated by walk-through inspections, review of construction records, questionnaires distributed to school officials, and bulk and air sample analysis. All of the target schools had been built or had had major construction done between 1946 and 1973. Responses to the questionnaires were received from only 27.4 percent of the target schools, and many contained inaccurate samples, 173 contained asbestos. Most air samples contained less than 0.04 asz7c fibers per cubic centimeter (fibers/cc). Samples from four schools contained 0.06 to 0.16 fibers/cc. The asbestos material in these schools was badly damaged. For 49 of the schools with documented asbestos exposures, control actions were recommended.

Julian, Y., and W. C. McCrone. "Identification of Asbestos Fibers by Microscopical Dispersion Staining". Microscope Vol. 18, No. 1, April 1970. pp. 1-11. (OS)

The McCrone dispersive staining technique, based on the focal screening method of Cherkasov, was tested for identification of chrysotile (12001295), amosite (12172735), crocidolite (12001284), actinolite (12172677), tremolite (60649538) and anthophyllite (17068789) asbestos fibers. Axial illumination was used for dispersive staining. The asbestos types were identified and differentiated by the refractive index of the Cargille

liquid that gave matching wavelengths in the region near 550 nanometers. The matching wavelengths were plotted against the number of samples to obtain the range of colors for a given type of asbestos. A polarized microscope was not required, however, more definite data obtained with polarized light could eventually permit identification of the mine from which each asbestos sample came. The authors conclude that asbestos can be identified by dispersion staining, but more work is needed.

Kannerstein, M., et al. "Pathogenic Effects of Asbestos." Archives of Pathology and Laboratory Medicine. Vol. 101, No. 12 December 1977. pp. 623-628. (ME)

The enormous increase in the use of asbestos during this century has necessitated the intensive study of its pathogenic effects. The occurrence of pulmonary parenchymal and pleural fibrosis and an increased prevalence of pulmonary and gastrointestinal carcinoma and of pleural and peritoneal mesothelioma have been established. A relationship, also, to laryngeal carcinoma is probable. Mesothelioma has been associated with indirect occupational, domestic, and neighborhood exposure, and the possibility of a similar correlation of pulmonary carcinoma with low exposure has been suggested. Pulmonary fibrosis and pleural plaques have been demonstrated under these circumstances. The physical characteristics of the asbestos fiber appear to be the principal factors in its carcinogenic action. The ability of fine, short fibers, especially fragmented chrysotile, to reach the pleura would appear to account for many of the pathogenetic and anatomical features of asbestos-related disease.

Kannerstein, M. "Recent Advance and Perspectives Relevant to the Pathology of Asbestos - Related Diseases in Man." Presented at International Agency for Research on Cancer Biological Effects of Mineral Fibers Symposium, Lyon, France September 25-27, 1979. Vol. 1, pp. 149-163. (EN)

Technical feature the pathological contribution of asbestos fibers to occupational diseases is discussed. The morphology of lesions and pathological diagnosis is surveyed. Current studies focusing on the relationship between asbestos exposure and the incidence of mesothelioma, carcinoma, asbestosis, and other malignancies are examined. Areas for further research, including the refinement of analytical techniques and instruments, are summarized.

Knapp, Elaine S. "Asbestos: Still a Danger in Schools." State Government News. Vol. 27, No. 3, March 1984. pp. 4-9. (EN)

The use of asbestos materials in school buildings was common from the mid-1940s until EPA banned sprayed asbestos in 1973. The agency requires schools to inspect for the material and notify parents and employees of asbestos hazards; no removal or abatement is required by EPA. However, a recent EPA report found that many schools did not meet its June 1983 deadline for asbestos detection, recordkeeping, and notification. The problem is attracting national attention.

Koch, Kathy. "Congress Ready to Examine Asbestos Compensation Issue; But Regulation Lags." Congressional Quarterly Weekly Report. Vol. 40, Feburary 6, 1982. pp. 204-205. (PS)

Lang, R. D. "Asbestos in Schools: Low Marks for Government Action." Environment. Vol. 26, No. 9, pp. 14-20, 1984. (PA)

The problem of asbestos in the U.S. public schools gives every indication of being one of the most pervasive issues in the area of toxic torts in the years to come. The health hazards caused by exposure to asbestos result in a host of wide-ranging environmental, political, and legal questions of every grade and order, many of which have not been finally determined. For the most part, the attention has been on asbestos as the cause of some occupational diseases, and has specifically centered on the exposure of asbestos workers who inhaled the fibers. This article will outline another subject upon which increased focus may reasonably be expected: the significant health problems, the full impact of which will not be felt for years to come, caused by the presence of asbestos materials in American schools.

Langer, A. M, Pooley, F. D. "Identification of Single Asbestos Fibres in Human Tissues." Presented at International Agency for Research on Cancer Conference, Lyon, October 2-6, 1972. pp. 119-126. (EN)

Preparative techniques developed for the localization, characterization, and identification of single asbestos fibers in human tissues are discussed. By utilizing the carbon extraction technique, standard histologic sections may be prepared; they can be examined with the transmission electron

microscope and the electron microprobe analyzer. All asbestos fiber types may be differentiated and identified on the basis of morphological, structural, and chemical data."

Lee, Douglas H. K., Selikoff, Irving J. "Historical Background to the Asbestos Problem." Environmental Research. April 1979. Vol. 18, No. 2, pp. 300-315. (EN)

The history of asbestos use and associated environmental hazards from 2500 B.C. to the present is surveyed. Asbestos was used in the manufacture of pottery and clothing. Additional uses of the mineral were discovered from 1600 to the present, including the production of yarn and paper. Mining and production of asbestos has led to recognition of the mineral's carcinogenic properties.

Le Guen, J. M., Brudett, G. "Asbestos Concentrations in Public Buildings - A Preliminary Report." Annals of Occupational Hygiene. Vol. 24, No. 2, 1981, pp. 185-189. (PA)

Concentrations of asbestos (1332214) in various public buildings was determined. Using several sampling and analytical methods, airborne asbestos concentrations were measured in four schools, two other educational institutions, five houses, a television studio, and a theater. Asbestos containing building materials had been used at all of the test sites. Airborne asbestos concentrations all were less than 0.000000009 gram per cubic meter. At some sites, damage to the asbestos building materials was noted, and exposed fibers were visible.

Lemegh, C., et al. "Epidemiology of Mesothelioma in Israel." Environmental Research. Vol. 12, No. 2, October. 1976. pp. 255-232. (EN)

The distribution of the mesothelioma cases in Israel during 1960-72 and factors determining the incidence of the disease are discussed. Percentage distribution according to age, sex, and site of tumor; survival time according to tumor site; age-specific rates according to country of origin; annual incidence per year by district of residence, by number of inhabitants in residence area and by comparison to percentage in Canda, the U.K. and Israel; and percentage distribution according to asbestos exposure history and occupation are listed.

Martin, B., et al. "Asbestos Abatement in Oklahoma Schools." NIOSH, Grant No. 1 OH-01049-01, 24p., September 1980. (ER)

Information for the removal or encapsulation of asbestos (1332214) from public schools is presented. The necessary notifications, permits, protective equipment, training, air monitors and medical examinations are outlined. Requirements for emergency evacuation plans, caution signs, inspections, ventilation, wall and floor protection and the isolation of contaminated areas are discussed. Approved protective equipment, contractors and supplemental materials are listed.

Martischnig, F. M., et al. "Unsuspected Exposure to Asbestos and Bronchogenic Carcinoma." British Medical Journal. (6063), 19, March 1977, p. 746-755. (ME)

Two hundred and fifty men admitted to a thoracic surgical centre and matched controls were questioned in detail about their smoking habits. Of 201 men with confirmed bronchial carcinoma 58 gave a history of occupational exposure to asbestos, whereas only 29 out of 201 men matched for age and residential area who were admitted with other diseases gave such a history. This difference was statistically highly significant. The usual association of bronchial carcinoma with heavy smoking was observed, but asbestos exposure increased the risk of carcinoma whatever the level of smoking. These results are consistent with the hypothesis that asbestos exposure and the level of smoking act independently in causing bronchial carcinoma. The patients with carcinoma who had been exposed to asbestos presented on average three years earlier than those who had not been exposed. Asbestos regulations have eliminated the risk of exposure to workers in scheduled industries, so asbestos-induced diseases will probably be increasingly found among the many workers who have had incidental exposure to asbestos. It is therefore important to take a full occupational history.

McCrone, W.C. "Detection and Identification of Asbestos by Microscopical Dispersion Staining." Environmental Health Perspectives. Vol. 9, December 1974. pp. 57-61. (OS)

Asbestos fibers as small as 1 micron in diameter can be uniquely identified by light microscopy by employing dispersion staining methods. The technique described herein involves suspension of fibers in liquids of known refractive indices and observation of color display by means of dispersion staining objective. Wavelengths or indices of refraction may be determined at right angles to and parallel to fiber axes. This method is rapid and sensitive for identification purposes.

McCrone, W. W. "Evaluation of Asbestos in Insulation." American Laboratory. Vol. 11, No. 12, December 1979. (OS)

Guidelines for asbestos (1332214) sampling in United States schools are presented. Techniques for identifying the composition of insulation, soundproofing, and other building materials are discussed. Microscopic equipment used for fiber differentiation and quantitative chemical assessments are reviewed. Environmental Protective Agency (EPA) recommendations for friable materials sampling, preliminary analysis procedures to assure inclusion of principal fibers, and for polarized light microscopy for amphibole and serpentine identification are included. The physical properties of various asbestiform minerals and representative slides of 15 minerals are given along with appropriate slide preparation techniques.

McDonald A.D. "Malignant Mesothelioma in Quebec." Presented at International Agency for Research on Cancer Biological Effects of Mineral Fibers Symposium, Lyon. September 25-27. 1979. Vol. 2, pp. 673-681. (EN)

Technical feature all known, fatal cases of mesothelioma from 1960-78 in Quebec are reviewed. Of the 254 mesotheliomas registered, 181 occurred in males and 73 in females. About 40% of the male cases were attributed to occupational asbestos exposure; only 5.4% of female cases had been exposed occupationally. Intervals between first employment and death from mesothelioma were longer for miners and millers than for manufacturing workers. Evidence from this survey supports the view that mesothelioma risk after exposure to crocidolite is many times greater than that after chrysotile exposure.

McDonald, J. C. "Asbestos-Related Disease: An Epidemiological Review." Presented at International Agency for Research on Cancer Biological Effects of Mineral Fibres Symposium, Lyon, September 25-27, 1979. Vol. 2. pp. 587-602. (EN)

Evidence of the relationship between asbestos and specific diseases is culled from various cohort and epidemiological studies. The incidence of lung cancer and mesothelioma is related to fiber type, duration of exposure, and synergistic interactions with cigarette smoking. The risk of mesothelioma after chrysotile exposure appears small. Areas for future research, including the etiology of pleural calcification and the standardization of analytical tests, are identified.

Murphy, D. C. and L. D. Reed. "Health Hazard Evaluation Report No. HETA 82-193-1222, Western Hill Post Office, Cincinnati, Ohio." National Institute for Occupational Safety and Health, Cincinnati, Ohio, 8p. November 1982. (NT)

In April, 1982, NIOSH made an on-site inspection of the Western Hills Post Office, Cincinnati, Ohio, in response to a request for a health hazard evaluation. Workers expressed concern about four cases of lymphoma which had reportedly occurred during the past 2 years among their labor force. An analysis of medical records of the four workers with cancer revealed only two to have lymphoma. There were no apparent sources of chemical exposure at the worksite. Environmental sampling revealed no airborne organic vapors or particulate heavy metals in excess of OSHA Standards or NIOSH-Recommended Standards. Ceiling material contained no asbestos. Analysis of questionnaire and industrial hygiene data failed to demonstrate any existing hazardous condition at the worksite which might be associated with the verified cases of lymphoma. The cause or causes of the illness remains unknown, but it is unlikely that the lymphomas were related to work at the post office.

"New Study Shows States Not Regulating, Funding School Asbestos Cleanup." AFL-CIO/CLC Service Employees International Union Newsrelease. April 3, 1984. (EN)

A new study released by the Union shows little is being done at the state level to combat asbestos contamination of schools. This expensive cleanup undertaking is being advocated to reduce the future incidence of asbestos-related diseases in children and school workers. Although EPA regulations require school districts to inspect for friable asbestos and report findings. There are no regulations governing or mandating removal activities. A lack of state funds and legislation supporting asbestos removal is also noted.

Newhouse, Muriel L. "The Asbestos Industry and Statutory Control of Its Hazards." Presented at International Agency for Research on Cancer Carcinogenesis Risks Strategies Symposium, Lyon, November 30 - December 2, 1977, pp. 59-71. (EN)

Described are the history of: the asbestos industry, recognition of the association between asbestos and respiratory disease, and control regulations in the U.K. The difficulties in balancing the possible hazards of asbestos against its useful properties, the cost of control measures, and the availability of adequate substitutes are discussed.

Nicholson, William J., et al. "Asbestos Contamination in United States' Schools from Use of Asbestos Surfacing Materials." Annals of the New York Academy of Sciences. Vol. 330, 1979. pp. 587-596. (OS)

Samples of surfacing materials used in schools throughout the United States were analyzed for asbestos (1332214) content. In New Jersey schools, cafeterias, locker rooms, and custodial or boiler rooms. Visual inspection and analysis samples revealed three types of asbestos containing materials: a loose, friable fibrous asbestos spray material, a moderately dense asbestos spray material, and a plaster or textured paint material with an asbestos binder. About 66 percent of the schools with asbestos surfaces had some visible evidence of damage to the mateial. X-ray diffraction confirmed the presence of asbestos in sampled materials. Air samples were taken in 10 schools located in New Jersey, New York, and Massachusetts, which had visible damage of asbestos materials. Samples were collected on 0.8 micrometer pore size membrane filters and analyzed for chrysotile (12001295) asbestos content using electron microscopy. Chrysotile asbestos concentrations ranged from 9 to 1,950 manograms per cubic meter (ng/cu om). The author concludes that damaged asbestos containing material increases asbestos air concentrations, and warns against the long term exposure of children to asbestos concentrations above 100ng/cu m.

Nicholson, William J., Pundsack, F. L. "Asbestos in the Environment." Presented at International Agency for Research on Cancer Conference, Lyon, October 2-6, 1972, p. 126-131. (EN)

Sources from which asbestos may enter the ambient air and water are discussed, methods of measuring small quantities of asbestos are described, and data on the quantities found in the atmosphere and in rivers are presented.

Nicholson, William J., et al. Environmental Asbestos Concentrations in the United States." Presented at International Agency for Research on Cancer Biological Effects of Mineral Fibres Symposium, Lyon, Sept. 25-27, 1979. Vol. 2, pp. 823-828. (EN)

Worker exposure to asbestos in and around construction sites, and asbestos distributions in ambient air of U.S. cities were determined. Measurements of Chrysotile concentrations were made in buildings with asbestos-lined return air plenums and damaged asbestos surfacing material. In houses of asbestos workers, and around building where asbestos fireproofing

material was sprayed on steelwork, significant asbestos contamination was discovered: 43/89 air samples exceed 50 ng/cu m. Prompt appropriate control and remedial action is recmmended.

Nicholson, William J. "Public Control of Environmental Health Hazards (Regulatory Actions and Experiences in Controlling Exposure to Asbestos in the United States.)" Annals of the New York Academy of Sciences. Vol. 329, 1979, pp. 293-304. (EN)

Historical regulatory efforts to control human exposure to asbestos in the U.S. are reviewed with the passage of the Occupational Safety and Health Act of 1971, significant changes occurred. The principal manufacturers of asbestos products undertook major dust control projects and were generally in compliance with OSHA requirements. However, current occupational standards must be reassessed in the light of newly available data on asbestos health effects, including cancer, and workplace environments must be controlled accordingly. Few standards exist for the control of environmental asbestos exposures, particularly those in buildings containing asbestos in friable, thermal, fire, or acoustic insulation materials.

Nicholson, William J. "Toxic Substances: Background and Nature of the Human Health Problem." Presented at Government Institutes 1st Toxic Substances Law Seminar, Washington, D.C., December 9-10, 1976, pp. 63-70. (EN)

Problems associated with controlling toxic substances in the workplace and in the environment are illustrated in a discussion concerning asbestos. Data compiled by Irving Selikoff of the Mount Sinai School of Medicine in New York City showed the 30 year effects of relatively high asbestos exposures for insulation workers, but recent experience has indicated that much lower exposures can also produce disease. Synergistic effects, vinyl chloride and chemical carcinogenesis, and the lack of threshold data for humans are discussed.

Novick, Lloyd F., et al. "Asbestos in Vermont Schools: Findings of a Statewide On-Site Investigation." American Journal of Public Health. Vol. 71, No. 7, July 1981, p. 744. (EB)

"Pollution Topics." Environmental Health. Vol. 91, No. 12, December 1983. p. 339. (EB)

"Public Awareness of Asbestos Hazards Creating New Jobs." New York Times. February 10, 1983, p. D4. (EN)

Asbestos abatement has emerged as a business in the wake of public awareness of asbestos hazards. Asbestos was once a popular insulating material, but it was banned as a building material in 1973 because it causes lung disease. Asbestos abatement involves stripping or sealing over-encapsulating asbestos fibers. By June 27, 1983, all of the nation's public schools must report the presence of asbestos under an EPA ruling.

Reed, L. D. "Health Hazard Evaluation Report. No. HETA-82-179-1154, Wilmington High School, Wilmington, Ohio." Hazard Evaluations and Technical Assistance Branch, NIOSH, Cincinnati, Ohio, 8 pages. August 1982. (NT)

Ceiling materials were evaluated for asbestos (1332214) content in classrooms at Wilmington High School (SIC-8211), Wilmington, Ohio, on April 9, 1982. The evaluation request came from the business manager of the school on behalf of 2,200 students, teachers, and employees. Bulk samples of ceiling materials and particulate air samples were analyzed. The bulk samples indicated that eight of nine ceilings contained 20 to 30 percent chrysotile asbestos. No asbestos fibers were found in air samples. The author concludes that students, teachers, and staff are not exposed to airborne asbestos fibers. As long as the ceiling tiles remain uncompromised, no health hazard exists. If the integrity becomes compromised, appropriate sealants should be used, and in the event of installation or destruction of the ceilings, protective equipment should be used.

Rohl, Arthur N., et al. "Asbestos Exposure During Brake Lining Maintenance and Repair." Environmental Research. Vol. 12, No. 1, August 1976, pp. 110-129. (EN)

Data obtained on asbestos exposure of garage mechanics during brake lining maintenance and repair work show that fiber concentrations frequently in excess of regulated limits are common. The presence of chrysotile, which ranges from chrysotile in both fiber and fibril form in air and brake drum dust samples, and the chrysotile asbestos content of personal air samples are measured by various techniques. While the types of measurements correlate positively, the present technique of optically counting asbestos fibers may considerably underestimate the levels of total asbestos exposure.

Rohl, A. N., et al. "Endemic Pleural Disease Associated with Exposure to Mixed Fibrous Dust in Turkey." Science. Vo. 216, No. 4545, April 30, 1982, pp. 518-521. (EN)

Such diseases as lung cancer, pleural mesothelioma, interstitial parenchymal fibrosis, and pleural classification and fibrosis were found in unusually high rates among the citizens of certain villages in South-Central Turkey. Samples taken from the environment and lung tissues showed the presence of the fibrous zeolite mineral erionite. New test reveal the presence of asbestos minerals to also be contributing factor.

Rohl, Authur N., et al. "Environmental Asbestos Pollution Related to Use of Quarried Serpentine Rock." Science. June 17. 1977. Vol. 196, No. 4296, pp. 1319-1322. (EN)

Crushed serpentine quarried in Montgomery County, MD, has been used extensively for paving roads and othr surfaces. The mineral assemblage includes antigorite or lizardite as well as chrysotile and tremolite. Air samples taken near serpentine-paved roads show that chrysotile concentrations are about 1000 times greater than those typically found in urban ambient air in the U.S.

Ryckman, Mark D., et al. "Asbestos Control Program for Institutional Facilities." Journal of Environmental Engineering-American Society of Civil Engineering. Vol. 109, No. 2, April 1983, pp. 275-289. (EN)

Asbestos-containing materials have been used in 20-50% of the institution in the U.S. EPA estimates that between 100-6800 people may be expected to die prematurely of cancers due to non-peak asbestos exposure at the prevailing levels in schools.

Sawyer, Robert N. et al. "Airborne Fiber Control in Buildings During Asbestos Material Removal by Amended Water in Methodology." Environmental Research. Vol. 36, No. 1, Febrary 1985, pp. 46-56. (EN)

Removal of friable asbestos material from buildings can cause high levels of airborne contamination. The efficacy of control methods recommended by EPA was evaluated by examination of 503 air samples obtained in 40 removal projects. The EPA-amended water methodology, when effectively administered, can provide a high degree of contamination control. Mean fiber levels in

the work area were well below those of dry removal. The range of fiber levels during removal was 0-37 fibers/cu cm.

Sawyer, Robert N., Swoszowski, Jr. E. J. "Asbestos Abatement in Schools: Observations and Experiences." Annals of the New York Academy of Sciences. Vol. 330, 1979, pp. 765-776. (PA)

Technical, social, and political factors that affect the performance of asbestos (1332214) abatement programs undertaken in school buildings were discussed. Over 50 abatement programs were evaluated, and in most cases the performance was satisfactory.

Sawyer R. N. " Asbestos Exposure in a Yale Building - Analysis and Resolution." Environmental Research. Vol. 13, No. 1, February 1977, pp. 146-169. (ME)

Over 500 air samples were obtained during surveillance, experimentation, and asbestos removal. This report presents data obtained from 200 samples examined to date and outlines procedures used in the operaion.

Scheibla, Shirley Hobbs. "Heat On Asbestos: Legislative, Legal Challenges to Producers Mount." Barrons, March 5, 1979. pp. 4-6. (EN)

About 800,000 tons of asbestos are used every year in 3,000 products for which no acceptable substitutes exist. Asbestos dust particles are very sharp and, once in the lungs, are not exhaled; these particles cause asbestosis and cancer. Armed with diagnostic proof of asbestos-induced cancers, many workers and their heirs are now suing industry. Litigation is broadening to include workers' families contaminated by handling work clothing, and people who live downwind from asbestos plants. Past and pending suits are discussed. Congress has directed NIEHS to: estimate the risk of low level exposure and costs of asbestos controls; determine if there are other fibers that might cause problems similar to those of asbestos; and survey schools for hazardous asbestos conditions.

Schmidt, William E. "Huge Cost of Removing Asbestos Daunts Schools." New York Times. October 5, 1983. p. A21. (EN)

A recent report by the U.S. Dept. of Education indicates that it will cost about $1.4 billion to remove asbestos from

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14,000 private and public school buildings around the country. Many school officials are alarmed about where they will be able to find money to finance these renovations. Removal costs are estimated to run about $100,000 per school building, and a recent survey indicates that over half of the schools in the U.S. have not yet identified and reported on asbestos-containing buildings in their ares.

"School Asbestos Program." Journal of Iowa Medical Society. Vol. 69, No. 6, June 1979, pp. 248-249. (ME)

Selikoff, Irving J. "Twenty Lessons form Asbestos." EPA Journal. Vol. 10, No. 4, May 1984. pp. 21-25. (EN)

Occupational and non-occupational exposures to asbestos over the last 60 years are manifest in the widespread incidence of related diseases. There have been more than 100,000 deaths related to this mineral, and another 350,000 are anticipated before the effects of past exposures have run their course. The observation of so much serious disease has led to increased understanding of the circumstances in which it has occurred. Lessons learned form past asbestos exposure concern theories of latency, dose disease response, multiple factor interaction, disease with brief exposure, environmental persistence, limitations of epidemiology, and other concepts and facts.

Silver, F. A. " Asbestos in School Buildings: Results of a Nation-Wide Survey." Annals of the New York Academy of Sciences. Vol. 330, 1979. pp. 777-786. (PA)

Descriptions are given of the activities pursued by these 13 states. Other factors which are discussed include federal involvement in the problem, issues surrounding an asbestos exposure standard for school buildings, the cost of correcting the problem, and public education on the situation. The author presents a list of recommendations for the identification and control of asbestos in school buildings that can be implemented by both state and federal governments.

Skulas, I. M. " Health Risks Associated with Asbestos: An Instrument to Facilitate Removal of Point Sources from the Secondary Laboratory." Dissertation Abstracts International Section A: Humanities and Social Sciences. Vol. 43, NO. 7, 1983. (PA)

The EPA School Asbestos Program has tried to eliminate asbestos found in school building materials. However, the program has

comprised the experimental abatement materials. A sub- ignored the many serious health threats posed by smaller, individual ("point") asbestos sources prevalent in specialized instructional areas (i.e. secondary chemistry laboratories). An instrument was designed to provide laboratory asbestos abatement guidance and magnify the usefulness of existing general materials. A stratified, randomized, control group post test only design assessed the tool's effectiveness. One high seniority chemistry teacher from each secondary school in a southeastern Michigan county was placed into either a larger or smaller school category, predicated on athletic class rating. Half of each category was combined to form a control group which received general and asbestos materials. The remaining members of each category sequent post test assessed participant reaction to the materials.

Spooner, C. M. "Asbestos in Schools - A Public Health Problem." New England Journal of Medicine. Vol. 301, No. 14, October 4, pp. 782-783. (ME)

Stavisky, L. P. "State Responsibility for the Control of Asbestos in the Schools." Journal of School Health. (United States). Vol. 52, No. 8, August 1982, pp. 358-364. (ME)

Stupfel, Maurice, Madaleine Mordelet-Dambrine. "Penetration of Carcinogens Through Respiratory Airways." Presented at International Agency for Research on Cancer/French National Institute of Health & Medical Research Symposium on Environmental Pollution & Carcinogenic Risks. Lyon, Nevember 3-5, 1975, pp. 61-73. (EN)

Attempts made to explain lung carcinogenses is by physical processes, enzymatic activation or inhibition, and physiological and immunological reactions taking place during the travel of the potential carcinogenic substance through the respiratory airways are analyzed. Volatility and solubility determine the penetration of gases and aerosols in the respiratory tract. Trace elements of fiber glass, metals, and polycyclic hydrocarbons absorbed into the asbestos fibers inhaled by factory workers may act as carcinogens.

Szendroi, M., et al. "Asbestos Bodies in a Bile Duct Cancer After Occupational Exposure." Environmental Research. Vol. 30, No. 2, April 1983, pp. 270-281. (EN)

Factor affecting a case of asbestos after five years of occupational exposure are recounted. An autopsy revealed

the presence of cholelithiasis and a cancer developing from the cystic duct which were identified as a squamous cell carcinoma. Short asbestos bodies and fragments were determined to have the same shape as those observed in the lungs. The effects of asbestos exposure in teh carcinogenesis of the observed bile duct cancer are discusses.

Whitwell, F., Muriel L. Newhouse and Diane R. Bennett. "A study of the Histological Cell Types of Lung Cancer in Workers Suffering from Asbestosis in the United Kingdom." British Journal of Industrial Medicine. Vol. 31, No. 4, October. 1974. pp. 298-304. (EN)

(The predominant cell type of lung cancer in workers with certified asbestosis who died of carcinoma of the lung in the U.K. from 1962-72 is studied.) Clinical data, necropsy reports, histological sections, and in some cases paraffin blocks were obtained from the nine pneumoconiosis panels. The difficulty in finding a comparable series of non-asbestos -exposed individuals is pointed out. Cigarette smoking can exert a carcinogenic effect on different parts of the bronchial tree, producing squamous tumors proximally and adenocarcinoma distally. Asbestos dust lying in distal parts of the lung may exert a co-carcinogenic, probaly a multiplicative, effect with tobacco smoke, thus producing adenocarcinoma of the distal part of the respiratory tract in the country and from hospitals where the patients had been treated.

Zimmet, Nancy. "Teachers Organize: Asbestos in the classroom." Science for the People. Vol. 14, No. 5, September - October, 1982. pp19-24. (EN)

In 1972 contractors used standard construction techniques to build a new high school in Newton, MA. Standard procedures included the spraying of asbestos on all internal support structures. Over the few years following the spraying the asbestos dried out as its dust contaminated the building's air. Teachers organized the asbestos removal task force in 1973, and students and their parents joined. Public demonstations and marches helped the school to appropriate financing for enclosing the sprayed areas. In 1980, further public appeals and campaigns led to the removal of asbestos from the school.

Zurer, Pamela S. "Asbestos: The Fiber that's Panicking America." Chemical & Engineering News. Vol. 63, No. 9, March 4, 1985, pp. 28-40. (EN)

Anxiety over asbestos in buildings began to grow in earnest in 1984 when EPA started highly publicized efforts to enforce its asbestos-in-school rule. Asbestos is also being taken out of many private and public offices buildings. While the health risks of breathing high amounts of asbestos fibers are clear, the relationship between the amount of fiber inhaled and the amount of disease is less certain. Problems inherent in establishing dose-response curves, documenting exposure measurements, and qualitative risk assessments are addressed.

IV. FEDERAL REGULATIONS AND STATUTES

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The citations included here are taken from the Federal Register, that contains announcements of the Federal regulations and legal notices. These regulations were promulgated by several different agencies, and all have to do with asbestos.

Rule: 40 CFR Part 33
Source: Federal Register. Vol. 50, No. 114, June 13, 1985, p. 24876.

EPA issues class deviation to provide that procurement protest determinations by Asbestos Abatement (Schools) Program recipients shall be subject to appeal to EPA only in cases relating to noncompetitive practices between firms and organizational conflicts of interest, affecting those recipients anticipating issuance of notices to contractors to proceed during June-August 1985. Effective June 13, 1985. See also additional class deviations reference public notice of bid or RFP solicitations and small business contracting (June 13).

Rule: 40 CFR Part 30
Source: Federal Register. Vol. 50, No. 114, June 13, 1985, p. 24876.

EPA issues class deviation to permit Asbestos Abatement (Schools) Program recipients to receive reimbursement for certain preagreement costs. Effective June 13, 1985. Contact: Paul Wagner (202) 382-5292.

Rule: 40 CFR Part 32
Source: Federal Register. Vol. 50, No. 094, May 15, 1985, p. 20210.

EPA revises authorities under assistance programs debarment and suspension regulations to include School Asbestos Abatement Program, substitute avenue of internal administrative review to replace Bid of Assistance Appeals, permit use of ordinary mail for case review decision notification and eliminate unnecessary verbiage and restructure content of section 32.207. Effective May 15, 1985. Contact: Robert Meunier (202) 475-8028.

Proposed: 40 CFR Part 763
Source: Federal Register. Vol. 49, No. 116, June 14, 1984, p. 24552.

EPA proposes to grant Service Employees Intl Union (SEIU) request abatement activities in schools and other buildings. Doc. No. OPTS-211012C; TSH-FRL 2608-3. Contact: Edward Klein (202) 544-1404.

Proposed: 40 CFR Part 763
Source: Federal Register. Vol. 49, No. 75, April 17, 1984, p. 15094.

EPA to hold public meeting reference current options for asbestos abatement in E&S schools and public buildings, pursuant to the EPA response to Service Employees Intl Union (SEIU) petition (see March 7, 1984, 49 FR 8450); May 7, 1984, 9 am, 330 Independence Avenue SW, Washington, D. C., Doc. No. OPTS-21101A; TSH-PRL 2566-5.

Proposed: 40 CFR Part 763
Source: Federal Register. Vol 49, No. 46, March 7, 1984, p. 8450.

EPA responds to Service Employees Intl Union (SEIU), AFL-CIO, for rulemaking proceedings reference the abatement of friable asbestos-containing materials in public and private E&S (elementary and secondary) schools, and public/commercial buildings, and the inspection and abatement of these materials. EPA will continue to gather information on the extent of compliance with asbestos standards, and its Technical Assistance Program (TAP) to assist in detection. SEIU requests establishment of standards and requirements for corrective actions when asbestos is found to be hazardous. Comment deadline April 23, 1984. Meeting, May 7, location to be announced. Doc. No. OPTS-211012. Contact: Jack McCarthy (202) 554-1404.

Rule: 40 CFR Part 763
Source: Federal Register. Vol. 47, No. 170, September 1, 1982, p. 38535.

EPA corrects provision in regulation requiring schools to be inspected for building materials containing asbestos to add equivalent estimation method for determining amount of asbestos in bulk samples. Effective June 28, 1982. Doc. No. OPTS-61004C.

Rule: 40 CFR Part 763
Source: Federal Register. Vol. 47, No. 103, May 27, 1982, p. 23360.

EPA requires public and private secondary and elementary schools to inspect and identify friable asbestos-containing building materials in order to correct potential for exposure to airborne asbestos. Requires schools to keep records and notify employees on ways to reduce exposure. Consultation with EPA regional asbestos coordinators is encouraged. Effective June 28, 1982. Compliance by educational agencies by May 27. Doc. No. 61004B.

Rule: 34 CFR Part 230 & 231
Source: Federal Register. Vol. 46, No. 11, January 16, 1981, p. 4536.

"Department of Education makes available grants to LEAs and SEAs to identify and correct asbestos hazards in schools pursuant to Asbestos School Hazard Detection and Control Act (45 FR 61950).

Rule: 40 CFR Part 763
Source: Federal Register. Vol. 46, No. 8, January 13, 1981, p. 3033.

"EPA correction to proposal reducing risk of exposure to asbestos-containing materials in school. Doc. No. OPTS-61004A."

Proposed: 40 CFR Part 763
Source: Federal Register. Vol. 45, No. 182, September 17, 1980, p. 61966.

"EPA to require all public and private elementary and secondary schools to identify friable asbestos-containing materials in school buildings, pursuant to PL 96-270, Asbestos School Hazard Protection and Control Act. Discusses history, definitions, test procedures, etc; forms and guides throughout. Schedules hearing; November 17, 1980, 9 am, HHH Building, Washington, D.C. Comment deadline November 3, 1980. Doc. No. OPTS 61004."

Rule: 34 CFR Parts 230 & 231
Source Federal Register. Vol. 45, No. 182, September 17, 1980, p. 61950.

"Department of Education to implement PL 96-270, Asbestos School Hazard Detection and Control Act: makes available federal grants to LEAs and SEAs, for identifying hazards in school buildings and interest-free loans to LEAs to make corrections. Comment deadline November 3, 1980."

Proposed: 40 CFR Chapter 1
Source: Federal Register, Vol. 44, No. 184, September 20, 1979, p. 54676.

"EPA publishes ANPRM on its plan for surveying E&S schools to determine whether they contain friable asbestos containing materials; corrective actions; and periodic reevaluation. Comment deadline November 5, 1979. Doc. No. OTS 61004. See original notice on school asbestos program at 44 FR 17790, March 23, 1979."

Proposed: 40 CFR Chaper I
Source: Federal Register. Vol. 44, No. 136, July 31, 1979, p. 40900.

EPA accepts petitions from Environmental Defense Fund and New Jersey with respect to regulating asbestos-containing material in schools.

Public Law Notice: S. 1658, Asbestos School Hazard Detection and Control Act of 1980, became PL 96-270 on June 14, 1980 (94 Stat.487).
Source: Federal Register, Vol. 45, No. 119, June 18, 1980,

V. CONTACT POINTS FOR INFORMATION

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EPA Contacts

- Asbestos Information Hotline — (800) 424-9065 / (202) 554-1404

- Asbestos Action Program — (202) 382-3949

- Asbestos Technical Information Service, Research Triangle Institute — (800) 334-8571

- EPA Regional Asbestos Coordinators:

  Mr. Paul Heffernan — (617) 223-0585 / (FTS) 223-0585
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  Air & Hazardous Materials Div.
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1200 Sixth Avenue
Seattle, WA 98101
(206) 442-2632
(FTS) 399-2870

- EPA Headquarters Library
  (202) 382-5922
  (FTS) 382-5922

Additional Contacts

- Consumer Product Safety Commission
  (800) 638-2772
  -- Asbestos in products or homes

- American Federation of Teachers
  Public Relations Office
  (202) 879-4458
  -- School asbestos program